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## Memorandum

Date: 25 July 1995

To:

From: Edwin C. May, Ph.D.

Re: SAIC Experiment Database

Cc:  Michael Mumford, Ph.D. and Andy Rose, Ph.D. (AIR)

I have been asked to identify a complete list of experiments that were conducted at Science Applications International Corporation (SAIC) from 4 February 1991 through 30 September 1994. This memorandum lists the experiments, describes their justification, and tabulates their overall results. In addition, complete references to the original reports will be provided.

### **Background**

It is instructive to understand the context in which SAIC was contracted to conduct research into anomalous mental phenomena. Following the example of the previous Cognitive Sciences Program at SRI International, we were asked to create a Scientific Oversight Committee (SOC) that would be actively involved in monitoring the research. The SOC's charter was to:

- Review and approve a detailed written protocol, including all statistical analyses, for each proposed experiment.
- Exercise unannounced "drop-in" privileges to observe experiments in progress.
- Review, in written form, the final reports and the conclusion of each study.
- Provide guidelines for future research.

To comply with a Congressional-directed requirement, the first four months of the contract were used to prepare a 5-year integrated research plan. Following that, technical and human-use protocols had to be officially approved before any experimentation could begin. Thus, data collection began in January 1992. Experiments continued, albeit with gaps to prepare and seek approval for more protocols, through March, 1994.

All approved technical and human-use (i.e., Institutional Review Board) protocol documents, final reports, and SOC comments are on file with the sponsor and are available for review.

## Experiment Database Summary

All experiments may be found in one of two documents or additionally in separate publications:

- (1) May, E. C., Luke, W. L. W., and Lantz, N. D. (3 February 1993). Phenomenological Research and Analysis. Final Report: 6.2 and 6.3.
- (2) May, E. C., Luke, W. L. W., and James, C. L. (29 September 1994). Phenomenological Research and Analysis. Final Report.

Ten experiments were conducted by SAIC under government contract. These experiments include all pilot and formal series, and they contain all the trials that were conducted (i.e., there is no file-drawer problem, by definition). Table 1 shows the summary information for the 10 SAIC experiments.

Table 1.

SAIC Experiment Database (1991-1994)

Number	Experiment	Reference	Trials	Effect Size	P-Value
1	<u>Target Dependencies</u>	1 (11-30)	200	0.124± 0.071	0.040
2	AC of Binary Targets	1 (31-38)	300	0.123±0.058	0.017
3	MEG Replication	1 (39-48)	12,000s	MCE	MCE
4	AC With Binary Coding	1 (49-56)	40	-0.067±0.158	0.664
5	AC in Lucid Dreams (B-Line)	1 (58-60)	24	0.088±0.204	0.333
6	AC in Lucid Dreams (Pilot)	1 (58-60)	21	0.368±0.218	0.046
7	<u>Remote Observation</u>	2 (2-3)	48	0.361±0.144	0.006
8	ERD EEG Investigation	2 (3-11)	7,000s	MCE	MCE
9	ERD AC Behavior	2 (3-11)	70	0.303±0.120	0.006
10	<u>Entropy II</u>	2 (11-12)	90	0.550±0.105	9.1×10 <sup>-8</sup>

References are shown as Document Number (Beginning-Final Page). Those experiments that are underlined may also be found elsewhere. Experiments 1 and 10 have been published in the peer-reviewed journal, *Journal of Parapsychology*, Vol. 58. 285-302, and experiment number 7 may be found in an Institute of Noetic Sciences publication. (These additional documents have been made available to the review team.)

Experiments 3 and 8 were physiologically oriented and the number of trials shown is the approximate number of stimuli.

The effect size and its associated p-value is computed across all conditions and across all subjects and is provided as a conservative guideline.\*

\* For this casual meta-analysis, I combined, *post hoc*, the results across receivers and conditions. With some exceptions, it is not my policy to combine data across individuals. I believe this is incorrect if one is studying the parameters of exceptional performance.

## Experiment Details

This section includes the *raison d'être* and conclusions for each experiment listed in Table 1. The protocol details may be found in the technical proposals to the SOC and in the formal descriptions either in the primary two reports or their associated publications.

### 1. Target and Sender Dependences

In anomalous cognition (AC)\* experiments, it is important to know if the quality of the data depend upon whether a second individual (i.e., a sender) is focusing attention on the target material. Secondly, it is claimed in the Ganzfeld literature that dynamic targets (i.e., video clips) are "better" targets than are static ones (i.e., photographs).

We found that a sender is not a necessary condition for good AC and, contrary to the Ganzfeld results, we found that static targets produced stronger AC than did the dynamic ones. In addition, we found a significant correlation with the quality of AC and the gradient of Shannon entropy for the static targets. The effect size quoted in Table 1 is computed across sender and target conditions.

These results led to the publication of Managing the Target-Pool Bandwidth: Possible Noise Reduction for Anomalous Cognition Experiments, *Journal of Parapsychology*, Vol. 58, 303-313 and a revised version of Shannon Entropy as an Intrinsic Target Property: Toward a Reductionist Model of Anomalous Cognition, in press, *Journal of Parapsychology* and Appendix D in document number 2.

### 2. Enhancing Detection of AC of Binary Targets

There are a few examples in the literature that suggest that information theory and error correction may increase the detection of AC. This experiment was designed to enhance binary hitting rate by applying sequential analysis to a sequence of single AC decisions at the binary bit level. Two novices receivers and one experienced one contributed 100 overall binary trials.

The experienced receiver (i.e., 531) who had produced significant results in SRI's random number generator experiment in 1979, produced a significant result in this experiment. Although this individual's result was significant at the  $10^{-7}$  level, the efficiency was low. That is, 213 individual binary calls were required to eventually arrive at a single sequential analysis decision. The effect size and p-value shown in Table 1 are computed for all three receivers; however, the significant combined result is exclusively because of receiver 531.

### 3. Magnetoencephalograph Replication

At the close of the SRI International Cognitive Sciences Program, May et al. reported significant neuromagnetic responses to sensorially and physically isolated image stimuli. The stimuli lasted for 100 ms and consisted of spatially low frequency sinusoidal grating. This experiment was an extensive replication attempt with substantially more data.

Although the preliminary results were promising, there was no statistical evidence of an effect. That is the effort and control conditions were statistically inseparable and care was

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\* A definition of terms may be found in the Glossary at the end of this memorandum.

exercised so that the experiment possessed sufficient statistical power that an effect of the magnitude of the SRI study would have been easily seen.

After the fact, a major fatal flaw was discovered in this and in the earlier experiment. The SOC, the neuroscience staff at Los Alamos National Laboratory, and the staff of the Cognitive Sciences Laboratory all failed to recognize the error. The dependent variable was the instantaneous phase shift of the dominant alpha rhythm concomitant with the stimulus. The Crammer-Rao condition, which sets lower limits on the variance in such measurements prevented us from seeing an effect, even if one existed.

This experiment, provided significant insight in the design of the next attempt to identify a central nervous system correlate to AC.

#### **4. Enhancing Detection of AC with Binary Coding**

The reason for this experiment was to develop a message sending algorithm using AC. Sets of five dichotomies were identified in our standard target pool (e.g., mountains versus flat) to act as "binary" bits in a standard two-by-five, error correcting block code.

This experiment produced no statistical evidence of AC, although the statistical power was quite low. Each of five receivers contributed only eight trials. Receivers' individual effect sizes ranged from -0.559 to 0.224.

The primary purpose was to use the error correction to "send a message ." The effect size shown in Table 1 is computed across all five receivers.

#### **5. AC in Lucid Dreams (Baseline)**

In a pilot series to determine if AC can be enhanced in the altered state known as a lucid dream (i.e., a dream in which the dreamer becomes aware that she or he is dreaming and can signal the waking world of this awareness). Three of the receivers were Lucidity Institute personnel had not been previously involved in AC experiments.

Each of these receivers contributed eight AC trials. One produced solid evidence for AC (i.e.,  $ES = 0.265$ ). The effect sizes from the remaining two receivers cannot be obtained without consulting the raw analysis data; thus, the value in Table 1 assumes an effect size of 0.0 for each of these receivers.

#### **6. AC in Lucid Dreams (Pilot)**

Twenty one trials were conducted in this pilot study. The conditions were not ideal in that each dreamer was allowed to take the intended target home for the night. Each target was doubly sealed in opaque envelopes and covert threads were attached to indicate any potential tampering. This breach of supervision was tolerated because of the additional benefit of the receivers being comfortable in their own beds. The effect size shown in Table 1 was computed from the rank-order analysis across 21 trials.

#### **7. Autonomic Detection of Remote Observation**

Many of the experiments conducted in the Former Soviet Union (FSU) suggest that biological systems make excellent targets for anomalous perturbation (AP). This particular experiment involves an isolated sender attempting to physiologically arouse a sensorially and isolated receiver. The state of arousal is measured by electrodermal activity.

This experiment successfully replicated the early work and lends support for the claims in the FSU.

## **8. Central Nervous System Response to AC Signals**

Generally, there is no known human activity that does not interrupt the production of alpha rhythm. This includes responding to external stimuli, internal mental activity, or intentionally moving a body part. We assumed, therefore, that AC would also interrupt alpha. Improving on earlier experiments, we collect EEG data and standard behavioral AC data that could be analyzed in the usual way. In addition, event related desynchronizations (ERD) resulting from direct stimulation by the AC target during the feedback phase of a trial were used as templates for match filters. These filters are the most sensitive way to search for the assumed similar ERD in the EEG record that was collected during the AC portion of the trial.

We have only analyzed one EEG lead and found no evidence of an AC-induced ERD. When time and resources become available, we will finish the analysis for the remaining leads.

Regardless of the outcome of this analysis, it will be a useful result; it is almost as interesting if there is no ERD while there is significant evidence for AC.

## **9. ERD AC Behavior**

Seventy trials were blind judged by the rank-order technique. Two of the receiver produced independently significant results, but the effect size shown in Table 1 is the combined result for all three receivers.

## **10. The Gradient of Shannon's Entropy**

This experiment is a replication of the entropy and target-type portion of Experiment 1. The protocol was substantially improved by narrowing the target-pool bandwidth and by monitoring the sessions. Conceptually, the entropy result appeared to replicate; that is, the larger the Shannon entropic gradient in the target, the better the AC. The significantly stronger effect size in the dynamic targets reflect the improved protocol. Because the significant correlation primarily came from the target difference, it is premature to assure that the gradient of the entropy is the deciding factor. Added to the manuscript for publication, were the successful Monte Carlo results that favorably support this hypothesis, however. The effect size shown in Table 1 was computed across target type and receiver.

## **Comments**

By definition, this data set does not contain a so-called file drawer problem. That is, all the data from the SAIC database were included for examination. For the six experiments that used a more traditional AC protocol, regardless of conditions, the weighted (by number of trials) effect size is  $0.230 \pm 0.047$  in 455 trials ( $p = 5.7 \times 10^{-7}$ ).\*

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\* All these experiments had been approved by the SOC and IRB.

## GLOSSARY

Not all the terms defined below are germane to this report, but they are included here for completeness. In a typical anomalous mental phenomena (AMP) task, we define:

- Anomalous Cognition (AC)—A form of information transfer in which all known sensorial stimuli are absent. That is some individuals are able to gain access to information by an as yet unknown process. This is also known as Remote Viewing (RV) and Clairvoyance.
- Agent—An individual who attempts to influence a target system by mental means alone.
- Analyst—An individual who provides a quantitative measure of AC. This individual usually is blind to experimental conditions and the intended target.
- Anomalous Perturbation (AP)—A form of interaction with matter in which all known physical mechanisms are absent. That is, some individuals are able to influence matter by an as yet unknown process. This is also known as Psychokinesis (PK).
- Beacon—An individual who, while receiving direct sensorial stimuli from an intended target, acts as a focus of attention for the receiver in AC experiments.
- Compute Assisted Search (CAS)—The use of computer-generated options which are linked to real-world objects in a Search task.
- Feedback—After a response has been secured, information about the intended target is displayed to the receiver or agent.
- Monitor—An individual who monitors an AMP session to facilitate data collection.
- Noise—Incorrect elements in an AC response.
- Protocol—A template for conducting a structured data collection session.
- Receiver—An individual who attempts to perceive by AC and report information about a sensorially isolated target. A Receiver is also known as a Subject or Percipient.
- Response—Material that is produced during an AC session.
- Search—The inverse of AC. That is, given a known target, determine its location. This is also known as Dowsing.
- Sender—An individual who, while receiving direct sensorial stimuli from an intended target, acts as a putative transmitter of that information to the receiver in AC experiments.
- Session—A time interval during which AMP data are collected.
- Specialty—A given receiver's ability to be particularly successful with a given class of targets (e.g., people as opposed to buildings).
- Target—An item that is the focus of an AMP task (e.g., person, place, thing, event).
- Target Designation—A method by which a specific target, against the backdrop of all other possible targets, is identified to the receiver (e.g., geographical coordinates).
- Trial—The smallest unit of data to be analyzed.

# Fax Transmittal Cover Sheet

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SG1I

To:  - ORD

From: Edwin C. May, SAIC

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Date: Thu, Jul 27, 1995 • 14:27

Transmitting (7) pages, including cover sheet.

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**Note:**

SG1I

this is a copy of the report I gave to the AIR folks on Wednesday. Please call if you have any questions. I will give you a report about the meeting by Monday.